

present demands, leaving out of consideration the increasing consumption, which will no doubt continue, the author points out that it would require 3,000,000 acres of conifer and other woodlands, or an annual cut of 50,000 acres of timber worked on a sixty years' rotation. Contrary to opinions held in other quarters, Dr. Nisbet anticipates the decrease in the supply, to this country at least, of pitwood. At present large supplies come from Bordeaux, but signs are not lacking that the quantity of suitable timber is decreasing, while the French collieries themselves show increasing demands. It would be a serious blow to all our industries dependent on coal should the supply of pitwood fail, and in any case the price is likely to increase, which will, other things remaining the same, raise the price of coal.

Another very important question to which the author directs attention is the wood-pulp industry. At the present time the United States dominate the paper market of the world, but there is an increasing shortage of suitable timber for the making of paper-pulp, which is, therefore, naturally increasing in price, and the recent large rise in the price of paper is due to the growing shortage in the supply of spruce. Since 1904, the cost of mechanical wood-pulp in this country has increased from 85s. a ton to 120s., while in America during the past ten years the price has increased threefold. The demand for pitwood and wood-pulp is bound to continue; in other words, there is a sure market for such produce, and the author, who is a widely recognised authority on such matters, points out that our waste lands and poor pastures are to a very large extent capable of producing conifers and soft-wood crops which could be established at comparatively little cost, and would yield good returns to the owner, and at the same time supply pit-wood for our mining industries and therefore indirectly benefit all industries dependent upon coal; and, lastly, with a sufficient supply of raw material for the making of paper-pulp a new industry would be created in this country.

There are altogether eleven chapters in the book, with an index at the end. Some very fine illustrations are also included. The first two chapters are mainly taken up with historical matters, which provide extremely interesting reading. The next two chapters deal with the sylvicultural characteristics of the oak and beech. In chapter v. the remaining hardwoods are considered, while the soft woods, such as alder, birch, lime, and poplars, are dealt with in chapter vi. Coniferous plantations of pines, firs, and larch are treated in chapter vii. Chapter viii. is more arboricultural, as it deals with hedges and hedgerow trees. Chapter ix. is occupied with the consideration of high-woods, copses, and coppicewoods, while the last two chapters, viz. x. and xi., are devoted to woodlands, game and sport, and the improvement of British forestry respectively.

The book is full of sound and trustworthy information. Its price is moderate, and it deserves a hearty reception from all those interested, directly or indirectly, in our forests and woodlands.

(2) This volume dealing with the form of trees is the final one of its series. The volume, like the

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previous one, has been seen through the press by Dr. Groom, who informs us in the preface that he has reduced changes from the original to a minimum. The few alterations and additions which were found necessary have been indicated by enclosure within square brackets. Part i. deals in a general way with the habit or form of trees, and, in addition to the text, the form or habit of the tree is indicated in many instances by illustrations, while the form of the branch-system is also indicated diagrammatically. A series of Mr. Henry Irving's well-known photographs illustrating the outward appearance of the bark has been included.

In part ii. the trees are detailed according to their form and other external appearances. The system of tabulation adopted is similar to that employed in the previous volumes. At the end we have an appendix which contains a classification of trees and shrubs according to their seedlings, and here we have many excellent drawings by Miss E. Dale from actual seedlings, the scale of magnification or reduction being indicated in each case. No doubt this appendix, as Dr. Groom points out, is not so complete as the author evidently intended to make it, yet it is, including the drawings, valuable so far as it goes, and is well worthy of careful study.

Taking the whole work as it now stands, we have five volumes which deal respectively with buds, leaves, flowers, fruits, and form, and it will be admitted on all hands that the late Prof. Marshall Ward has left behind a monumental work which will long be considered a standard on trees.

NEW BOOKS ON ORGANIC CHEMISTRY.

- (1) *Modern Organic Chemistry.* By Dr. C. A. Keane. Pp. xiv+503. (London: The Walter Scott Publishing Co., Ltd., 1909.) Price 6s.
- (2) *Practical Organic Chemistry.* By Dr. J. J. Sudborough and T. C. James. Pp. xviii+378. (London: Blackie and Son, Ltd., 1909.) Price 5s. net.
- (3) *The Elements of Organic Chemistry.* By E. I. Lewis. Pp. viii+224. (Cambridge: University Tutorial Press, Ltd., 1909.) Price 2s. 6d.
- (4) *Abhandlung über die Glycole oder Zwei atomige Alkohole.* By Adolf Wurtz. Pp. 96. Ostwald's *Klassiker*, No. 170. (Leipzig: W. Engelmann 1909.)
- (1) To anyone possessing a sound elementary knowledge of organic chemistry we can strongly recommend Dr. Keane's book. It is not a text-book, for there is no systematic arrangement of the materials, and the properties of individual substances and the relations of different groups are not brought into relief. If, for example the student wishes to learn something about ordinary phenol, he will find bits of scattered information in four different places. Systematic instruction is obviously not the object of the book. But although the treatment is unconventional, and frequent digressions are made into regions not usually embraced by organic text-books, this very fact rather enhances than detracts from the interest of the

volume. The subject is brought into touch with other branches of the science. Thus, under hydrocarbons, we read a little about thermochemistry; under aldehydes there is a reference to autoxidation; under acids there are a few words about steric hindrance; under ethereal salts (a rather antiquated term) a short account is given of mass action, and so forth. In addition to this there are separate chapters on laboratory methods, stereochemistry, the sugars, dynamic isomerism, heterocyclic compounds, and the physiological properties of organic compounds.

That the subjects are treated rather broadly than deeply seems no serious defect. They are sufficient for the general reader, who is provided with elaborate references if he desires to extend his knowledge. In conclusion, we would direct the author's attention to a few inaccuracies which have been noticed, and which might be modified or corrected in a future reprint. The two isomeric dimethylethylenes, which are stated to be known in only one form, have been prepared by J. Wislicenus (p. 310); the molecular weight of triphenylmethyl has been determined, and corresponds to the double formula (p. 423); Fischer and Slimmer were unsuccessful in effecting an asymmetric synthesis (p. 301); it is incorrect to state that propylene and hydrobromic acid give exclusively isopropyl bromide (p. 45).

We would also suggest the following:—Thiele's hypothesis requires amplification to be understood (p. 46); it is very questionable if the explosiveness of a compound depends upon its breaking up into stable molecules, for many silver salts share with silver oxalate this property, whereas a substance like platinum chloride does not explode; the statement that *ethyl* and *methyl* "cannot exist in the free state because they contain one of the carbon affinities unsaturated" (p. 27) is inconclusive, especially as triphenylmethyl is referred to later as possibly existing (pp. 36, 423); without some qualification it is misleading to say that Dumas's theory of types "was especially developed by Gerhardt," and "received the support of Williamson and Wurtz" (p. 17). In the first place, Williamson originated the idea of Gerhardt's types, which were simple inorganic compounds in which hydrogen could be replaced by radicals. They were intended to denote chemical behaviour and not relationships. Ether had no generic relationship to acetic anhydride, though they belonged to the same type. Dumas's types, on the other hand, were organic substances which were intended to show relationships produced by substitution rather than chemical behaviour.

(2) The "Practical Organic Chemistry" of Sudborough and James is rather a laboratory handbook or book of reference than a course of practical instruction. As stated in the preface, examples are given of different types of operations. These types are grouped together. Thus, there is a chapter on the preparation of hydrocarbons, one on alcohols, another on halogen compounds, acids, esters, nitro-compounds, sulphonic acids, and so forth. In addition, there is a preliminary chapter on organic analysis and molecular-weight determinations, and, at the end of the volume, a number of useful examples of analyses and the

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determination of physical constants such as are playing an increasingly important rôle in the study of structure. The descriptions are clear and full, and the photographic illustrations are masterpieces of their kind. Altogether the book is probably the most complete among those of home manufacture on the subject of practical organic chemistry that has yet appeared.

(3) This modest little volume, which is one of the University Tutorial Series, should form an excellent introduction to the study of organic chemistry, and if the process of practical instruction can be carried on concurrently with theoretical teaching, as the author does with his own class, nothing better could be desired. He takes a few of the commonest organic substances and uses them, as they can easily be used, to illustrate quite a large variety of chemical operations and products. If the substance of the book can be assimilated in the course of four school terms, as the author states, we think that both teacher and student should be satisfied with the result. May we suggest that the name of Wurtz should be spelt without the diæresis and Senderens without an *a*?

(4) One turns from the intricacies of a modern treatise on organic chemistry to Wurtz's classical memoir on the glycols with the same sense of relief that one listens to the simple melody of an early composer after the confused sounds of a modern orchestral symphony. Short and simple though it is, it is difficult to overrate the far-reaching results of Wurtz's research. It was not merely the discovery of a new class of alcohols and organic oxides, or an extension of Williamson's water type. It afforded for the first time clear experimental evidence of the existence of what were then termed "polyatomic" radicals. To quote Wurtz's own words:—

"The main result, which, in my opinion, is derived from these synthetic experiments, is not the discovery of the new compound, glycol—there are enough new compounds in organic chemistry—it is not even the synthesis of glycerine nor the difficulties connected with its preparation which have been successfully overcome; but it is the manner of the formation of glycol and the antecedent reactions which made it possible; it is the conversion of the allyl compound by which the iodide passed into glycerine. All these experiments, which were directed to the same end, have shown that an organic group united to 2 atoms of chlorine or bromine can replace two atoms of silver, and are therefore equivalent to two atoms of hydrogen, and that an organic group united to three atoms of chlorine or bromine can replace three atoms of silver and is equivalent to three atoms of hydrogen."

The theory of polyatomic radicals, like ethylene and glyceryl, soon developed into that of the polyatomic elements or the theory of valency, upon which the whole fabric of modern organic chemistry rests. Wurtz himself held perfectly clear views on the different valency of the elements. In his address to the Chemical Society in London in 1862 on ethylene oxide, he points out that as ethylene oxide represents a diatomic radical united to oxygen, so many of the metals may be regarded as diatomic elements. The paper is well worth re-reading, and is not by any means the least interesting addition to the *Klassiker*.

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